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Sixth day of August 2003

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**AUSTRALIA
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PROVISIONAL SPECIFICATION
FOR A PROVISIONAL PATENT**

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Invention Title: SHUTTER ARRANGEMENT

The following statement is a description of this invention

Shutter Arrangement

The present invention relates to shutters. In particularly preferred embodiments, the invention relates to plantation shutters.

Typically the shutters of the present invention include a plurality of louvre blades,
5 each blade being axially rotatable in unison with each other blade in the arrangement. The shutter of the present invention may be mountable in a winged frame such as may be used for a door or window or maybe mounted in a fixed frame such as may be used in a window.

A louvre blade assembly is described in Australian patent No. 714252 in which the
10 upper longitudinal side edge of each louvre blade is profiled to improve weather sealing by the provision of a ramp extending substantially across the edge. Whilst the ramped edge may reduce the splashing of water on its path down the plurality of shutters, it does not address the needs in the current market for shutters having improved light and heat transfer and insulation properties. Accordingly, an object
15 of the present invention is to provide an improved shutter arrangement which, at least to some extent, provides improved light and heat transfer and insulation properties.

According to one aspect of the invention, there is provided a shutter blade adapted to be pivotably mounted in a shutter frame, said blade including an elongate body
20 having a constant cross section along its length, said body including:

a main portion extending along a first edge of the body substantially the full length of the body, said main portion having a top external surface substantially convex in profile and an underside surface and

25 a minor portion integrally formed with the main portion and extending along the other edge of the body substantially the full length of the body, said minor portion having a top external surface substantially concave in profile,

whereby the portion of the underside surface of the main portion to the first edge has a profile adapted to rest in snug relationship to a like shutter blade in the depression defined by the concave external surface of the like shutter blade.

30 In another aspect of the invention, there is provided a shutter arrangement including:

a frame;

a plurality of shutter blades pivotably mounted in the frame and arranged in parallel relationship with their respective ends aligned;

5 a pivoting mechanism adapted to pivot the plurality of blades in unison, said pivoting mechanism including a pair of parallel rods capable of opposing reciprocal movement within the frame, said pair of rods having a plurality of crank key members, one for each blade, spaced along the lengths of the pair of rods and attached whereby to allow pivotal movement of the crank keys upon the opposing reciprocal movement of the pair of rods, each of said crank keys in turn fixed to one end of each corresponding blade,

10 wherein the opposing reciprocal movement of the pair of rods imparts uniform pivotal movement to each of the crank keys and, correspondingly, to each of the shutter blades such that the shutter blades move in unison with one another.

The blade may be made from a number of materials including those materials currently used for blades in the shutter industry. For example, the blades may be
15 made of timber, such as is the case with traditional plantation shutters, metal, such as aluminium, injection moulded plastic, glass or a combination of two or more of these materials.

The blade preferably has an adapted aerofoil shape comprising an upper surface having contours with opposing radii. The top external surface of the main portion
20 may include a curve in profile with a changing radius. The radius of the profile of the top external surface of the main portion may increase towards the longitudinal edge of the main portion and correspondingly decrease towards the minor portion. The main longitudinal edge may be slightly downwardly depending. The longitudinal edge of the minor portion may be upwardly extending. The
25 longitudinal edge of the main portion may be adapted to nestle in the depression in adjacent like blades formed between the minor longitudinal edge and the joining region between the minor portion and the major portion.

The underside surface of the main portion may follow substantially the same contour as the top external surface of the main portion, the profile of the main
30 portion slightly tapering towards the main longitudinal edge. Intermediate the width of the body corresponding to the underside surface at the junction between the main and minor portions there may be provided a thickened area adapted for mounting the blade at either end.

The shutter frame may comprise vertical posts or stiles which house the mounting means for the blades. The stiles may be parallel relative to one another and spaced by top and bottom horizontal frame members or rails approximately the same length as the shutter blades. The frame may be assembled in any one of a number of ways common in the art, including by means of tongues and mortises. The frame may be fixed in a wall or wing, or be hingedly mounted whereby to constitute a wing.

In a preferred embodiment, interposed between the pair of rods and one end of the shutter blade may be an infill. The infill preferably extends substantially the length of the stile. The infill may include spaced apertures for retaining the crank keys to be pivotably mounted therein. The opposite end of each blade is mounted for rotation. The crank keys are mounted to each of the rods by, for example, a peg and aperture combination, pop rivets or any other suitable arrangement allowing rotation of the crank key about each attachment to each rod.

- 15 The crank key may comprise any one of a number of designs and in its simplest form merely connects the pair of rods to the blade. The crank key is adapted to translate the linear reciprocal movement of the pair of rods into rotational movement of the blade relative to the pair of rods. Accordingly, the crank key may be inter alia square, block, round, disc-shaped or cruciform-shaped.
- 20 Preferably the crank key includes a doughnut shaped disc. The surface of the disc facing the stile preferably includes a pair of pegs or lugs standing proud therefrom to enable their insertion in appropriately located apertures in each of the rods. The surface of the disc facing the blade may include one or two pegs for insertion into corresponding apertures in the thick portion of the blade. This pivoting mechanism including the infill, crank key and pair of rods may be located adjacent the frame. However, preferably the pivoting mechanism is entirely housed within the stile. The stile may be rabbeted whereby to house the pivoting mechanism.

The pivoting mechanism may be connected together by attachment of the individual components to each other. However, it is preferable to have an elongate member which connects all of the components together. Accordingly, a cylindrical rod or fastener may extend from the stile, between the pair of rods, through the crank key and the infill into a locating aperture in the shutter blade whereby to secure the entire pivoting mechanism in place.

In a preferred form of the present invention, the plurality of crank keys are included so that the respective pairs of pegs on opposing faces of the crank key disc can be

offset relative to one another. By offsetting the pairs of pegs a restricted pivotal motion of the shutter blades about approximately 90° may be achieved so that the blades may pivot from a substantially horizontal open position in which the flow of air through the shutter arrangement is substantially unobstructed through to a

- 5 substantially vertical position in which each adjacent upper blade rests its main longitudinal edge in the recess of the minor portion of each lower adjacent blade.

In an alternative embodiment of the invention, the blade may be connected directly to the pair of rods. Upon the opposing reciprocal movement of the pair of rods, the blade may pivot in the frame. The pair of rods may be located in one or more tracks

- 10 in the stile and be secured at suitably spaced intervals directly to the plurality of shutter blades, such that the crank key and infill are dispensed with. As a person skilled in the art will appreciate, the locating pegs may be located on one of the pair of rods and the shutter blade and the corresponding apertures located on the other of the pair of rods and the shutter blade.

- 15 In a particular embodiment of the invention there is provided a plantation shutter made of timber. However, it should be noted that any appropriate material could equally be used. The plantation shutter is noticeably different to prior art shutters available. In the present invention, once installed there is no control bar/arm visible because this mechanism is hidden in the vertical frame member or stile. Moreover, 20 the louvre blade is uniquely shaped to provide advantages in terms of light and heat transfer and insulation properties as well as weather protection.

One aspect of the invention concerns the difficulties encountered in hiding the louvre rotation mechanism in the stile. It has previously been difficult to retain the louvre rotation mechanism out of view in the stile. To overcome this difficulty,

- 25 firstly the stile has been rabbeted to form a cavity to retain the louvre rotation mechanism. The louvre rotation mechanism includes control arms or rods described as "flat bars". Each flat bar is rectangular in cross section and extends substantially the length of the stile, with central apertures spaced along its length.

- 30 Secondly, the louvre rotation mechanism is provided with a plurality of discs each having a pair of faces. Extending from each face of each disc is a pair of protruding pegs or lugs. Each member of each pair of pegs on each disc are not directly aligned or coaxial to a corresponding member peg on the opposite face, but is offset to a particular angle. Each peg on the face facing the louvres is adapted to be received in a complementarily sized hole in one of the flat bars.

The louvre rotation mechanism further includes for each disc a screw type fastener which fastens the disc to the rabbeted stile. The fastener passes through the centre of the disc and each of the pegs is received in a corresponding hole of one of the flat bars. Each of the flat bars is located between the discs and the stile.

- 5 The arrangement further includes an infill made of the same material as the stile (*which is???*). the infill fits into the stile and is configured to allow each of the discs to reside in the infill in complementarily sized holes spaced along the length of the infill at about the same intervals as the apertures in the flat bars. The discs are adapted to rotate about the fastener within the holes in the infill. The infill is
- 10 located in the stile and covers the louvre rotation mechanism. The rabbeted configuration of the stile allows the flat bars adequate movement between the louvre rotation mechanism, the stile and the infill.

The infill may be secured when the horizontal frame members or rails are secured in corresponding mortises at the ends of the stile. The fasteners secure the louvre rotation mechanism to the stile thus allowing the shutter frame to be assembled as a complete unit. Paint finish may be applied and dried before the assembly of the louvre blades. This mode of paint application is desirable in that the frame can be finished in a colour the same or different to the colour finish of the louvre blades. Thus a two toned finish may be achieved.

- 15
- 20 The assembly of a complete frame without the louvre blades is highly desirable. Currently available products on the market which are known to the Applicant are painted complete with blades. The result is an undesirable finish as the paint will not cover hard to reach areas. In other currently available examples, the paint coats the louvre rotation mechanism (normally made of a metal composite). This is most
- 25 likely not compatible with the timber substrate and is likely to peel or not adhere to the metal composite resulting in an inferior paint finish. Moreover, there is the difficulty associated with popular so called d.i.y. (do it yourself) applications in which timber shutters are manufactured and sold raw (no paint finish, except a primer for certain applications). This makes a difficult job for someone without
- 30 expensive paint equipment to achieve the desired finish. The difficulties confronting them involve the control rods interfering with the application of the paint, the end of the blades between the stiles being difficult to reach and finish,

particularly when the second coat of paint is applied after sanding which in turn also presents difficulties.

The concept for the aerofoil design of the louvre blade occurred to the inventor whilst observing the flow of moist air which passed an aircraft wing forming a trail 5 behind the plane. The adapted aerofoil shape may provide a natural weather seal considered most desirable by the shutter industry. In a preferred embodiment of the invention, the louvre blades include a cross section with an opposing radius to complement the full radius of an adjacent blade when the blades are oriented in a downward position relative to their centre point corresponding to the axis of the 10 associated disc.

When so downwardly oriented it is possible that the arrangement would allow minimal drafts from outside or heat loss from inside. The louvre blades therefore optionally include a magnetic strip which runs the length of the blade and is located on the top outside edge and the bottom opposing outside edge of each louvre blade 15 which is adapted to cooperate with corresponding magnetic strips on each adjacent louvre blade. The magnetic strips are self aligning and self adhesive and are available commercially.

The magnetic strips are located whereby to attract each other when the blade is in the closed (downward) position and cause the blades to fall into alignment when the 20 magnetic strips are in close proximity. The magnetic strips enable the blades to cooperate in a closer fitting arrangement to minimise drafts or heat loss.

With regard to security, the presence of the magnetic strips increase the difficulty intruders may experience in attempting to pry open the blades with fingertips from the outside. The arrangement correspondingly also improves privacy with respect to 25 views external to the structure housing the shutter.

In another aspect, the invention provides a closed cell foam strip of similar dimensions and adjacent to each magnetic strip. When the adjacent blades move into close proximity relative to each, the magnetic force is sufficient to compress the foam to ameliorate the problems of heat loss and drafts when in the arrangement 30 is in the closed position.

The louvre blades may also incorporate renewable solar energy technology. the curved surface of the louvre blade may be adapted to receive solar cells or

sophisticated multi-layer amorphous silicon thin-film solar cells (refer to internet website www.ovonics.com/unitedsolar/energentek.html). The solar panels so described are flexible panels capable of conforming to a curved surface such as the preferred louvre blade shape of the present invention.

- 5 The flexible solar panels can be applied to the curved blades to provide solar energy storage capacity. This stored energy may be used in a number of applications, such as internal lighting, etc.

The curved surface of the preferred louvre blade, when viewed from the outside of the shutter in its open state (blades are horizontal), provides two curved surfaces.

- 10 Both of these curved surfaces are exposed to the outside environment. The solar cells are able to receive the solar rays from the side and do not require the solar rays to shine directly thereon. By allowing adequate reception and storage of solar energy the present arrangement has an advantage over flat form louvre blades of the prior art.
- 15 A succession of blades one above the other having flat solar panels would require near direct path for the solar rays whereby to achieve satisfactory storage of solar energy. In such a case the louvre blades would generally need to be close to perpendicular to the direction of the solar rays to achieve the optimum result. This would negative the purpose of the shutter which is to provide a view of the outside
- 20 as the optimum position of the blades for solar energy collection would be the worst position for the purposes of providing a view.

In a preferred form, the preferred shutter arrangement may provide the following:

- an innovative opposed radius louvre blade design;
- an excellent weather seal for louvre blades situated in a wing panel;
- 25 improved solar energy collection arrangement for shutters;
- an arrangement which is solar efficient in almost any blade position;
- hidden louvre rotation mechanism which is also inaccessible in normal operation;
- arrangement which is easier to assemble;
- enables one to apply a superior paint finish;

the use of a very small rotating radius for the louvre rotation mechanism allows the louvre rotation mechanism to fit inside very narrow stiles whilst still achieving an assembly with tight tolerances;

a stile which is adapted to contain the louvre rotation mechanism such that it fits

5 inside and can be secured whilst also allowing the flat bars adequate movement within the stile to operate the blades in unison.

The invention will be better understood from the following non-limiting description of the preferred embodiments, in which:

Figure 1 is an exploded perspective view of one embodiment of the present

10 invention;

Figure 2 is a closer view of the exploded arrangement of Figure 1;

Figure 3 is a side elevation/perspective view of the arrangement shown in Figure 1 and Figure 2;

Figure 4 is a schematic exploded representation of the means for mounting a shutter

15 blade in the arrangement shown in Figure 1; and

Figure 5 is a perspective view of the crank key used in the embodiment shown in Figure 1.

With reference to Figure 1, there is shown a shutter arrangement 1 having a frame 2 comprising a vertical post 3 on one side and a stile 4 on the other side, the vertical

20 post 3 and the stile 4 spaced in parallel arrangement in their installed state by horizontal frame members or rails, a top rail 5 and a bottom rail 6. Upon installation, the tenons 7 are inserted in corresponding mortises 8 in the vertical post 3 and the stile 4. Pivots mounted in the frame 2 is a plurality of shutter blades 9 shown in their open, horizontal position.

25 As shown most clearly in Figure 2, each shutter blade 9 comprises an integrally formed elongate body comprising a main portion 10 having a main longitudinal edge 11, a minor portion 12 having a minor longitudinal edge 13, each of the main and minor portions 10, 12 joined at a thickened portion 14. Each blade 9 includes a stile end 15 and a post end 16.

30 It can be seen that the top external surface 17 of the main portion is concave in profile and the underside surface 18 of the main portion 10 is correspondingly

marginally concave in profile whereby the underside surface 18 closely follows the contour of the top external surface 17, the main portion 10 tapering marginally towards the main longitudinal edge 11.

The top external surface 19 of the minor portion 12 has a concave profile defining a

- 5 depression between the minor longitudinal edge 13 and the thickened portion 14.
- The underside surface 20 of the minor portion follows the contour of the minor top external surface 19 between the thickened portion 14 and the minor longitudinal edge 13.

As the person skilled in the art can appreciate, when the blade 9 is pivoted from the

- 10 horizontal position shown in Figure 2 to a vertical closed position (not shown) by causing the main longitudinal edge 11 to travel in an arc downwards and the minor longitudinal edge 13 to travel in a smaller arc upwards, the blades 9 are spaced so that the main longitudinal edge 11 rests on the minor top external surface 19 whereby to provide a substantially weatherproof seal.

- 15 The blades 9 of the shutter arrangement 1 provide improved heat and light transference through the opening defined by the frame 2 due to the aerofoil profile of the blades 9. It can be seen that the blades, at any position inclined to the vertical, will permit the transfer of external light by direct reflection into a building. This permits an operator to adjust the inclination of blades 9 to a preferred setting
- 20 for aesthetic or privacy reasons, whereby the top external surface will still permit direct reflection of external light through the shutter opening into the interior of the building. The aerofoil profile of the blades 9 further enhance the flow of air through the shutter opening by the creation in air pressure differentials in the regions immediately surrounding the blades 9 to improve air circulation.
- 25 The complementary shapes of the upturned minor longitudinal edge 13 and the slightly downwardly curved main longitudinal edge 11 provide an improved weather seal when the blades are in the closed position. The improved weather seal provides improved heat and light insulation.

The pivoting mechanism 21 comprises an elongate infill bar 22, a plurality of crank

- 30 keys 30 and a pair of elongate parallel positioned rods 24, 25 all adapted to be housed within the stile 4. As best seen in Figure 4, the stile 4 is rabbeted to define a recess 26 in which the pivoting mechanism 21 may be fully housed and aesthetically hidden from view after installation.

As most clearly seen in Figure 5 each crank key 30 comprises a wheel 31 having an inward face 32 and an outer face 33. The inward face 32 has a pair of opposed pegs 34, 35 and the outer face 33 has a second pair of opposed pegs 36, 37. It can be seen that the inner pegs 34, 35 are offset relative to the outer pegs 36, 37 whereby

- 5 to restrict the maximum pivoting arc of the blades 9 to about 130°. The outer pegs 36, 37 for each crank key 30 are located in correspondingly located apertures 27. It will be appreciated that when the pair of rods 24, 25 are subjected to opposed reciprocal motion, for example first rod 24 moves downwardly and second rod 25 moves upwardly, the crank key 30 will pivot about its central axis 38. Accordingly,
- 10 when the inner pegs 34, 35 are located in corresponding apertures (not shown) in the thickened portion 14 of the stile end 15 of each of the blades 9, the rotation of the crank key 30 described above will cause the blades 9 to pivot towards the closed position.

As best seen in the top plan view shown in Figure 4 the blades 9 may be mounted to the frame 2 by means of a fastener rotationally mounting the post end 16 to the vertical post 3 by means of a lug 40 inserted in an aperture defined by insert 41 located in the thickened portion 14. At the stile end 15, the blade 9 is mounted by means of a screw type fastener extending from the stile 4 extending between the rods 24, 25 through the crank key 30 and the infill 22 and is located in the stile end 20 15 of the blade 9.

It will be appreciated by those skilled in the art that many modifications and variations may be made to the embodiments described herein without departing from the spirit or scope of the invention.

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Dated this 10th day of November, 2000

Justin Griffiths

By his Patent Attorneys

Chrysiliou Law

FIGURE 1

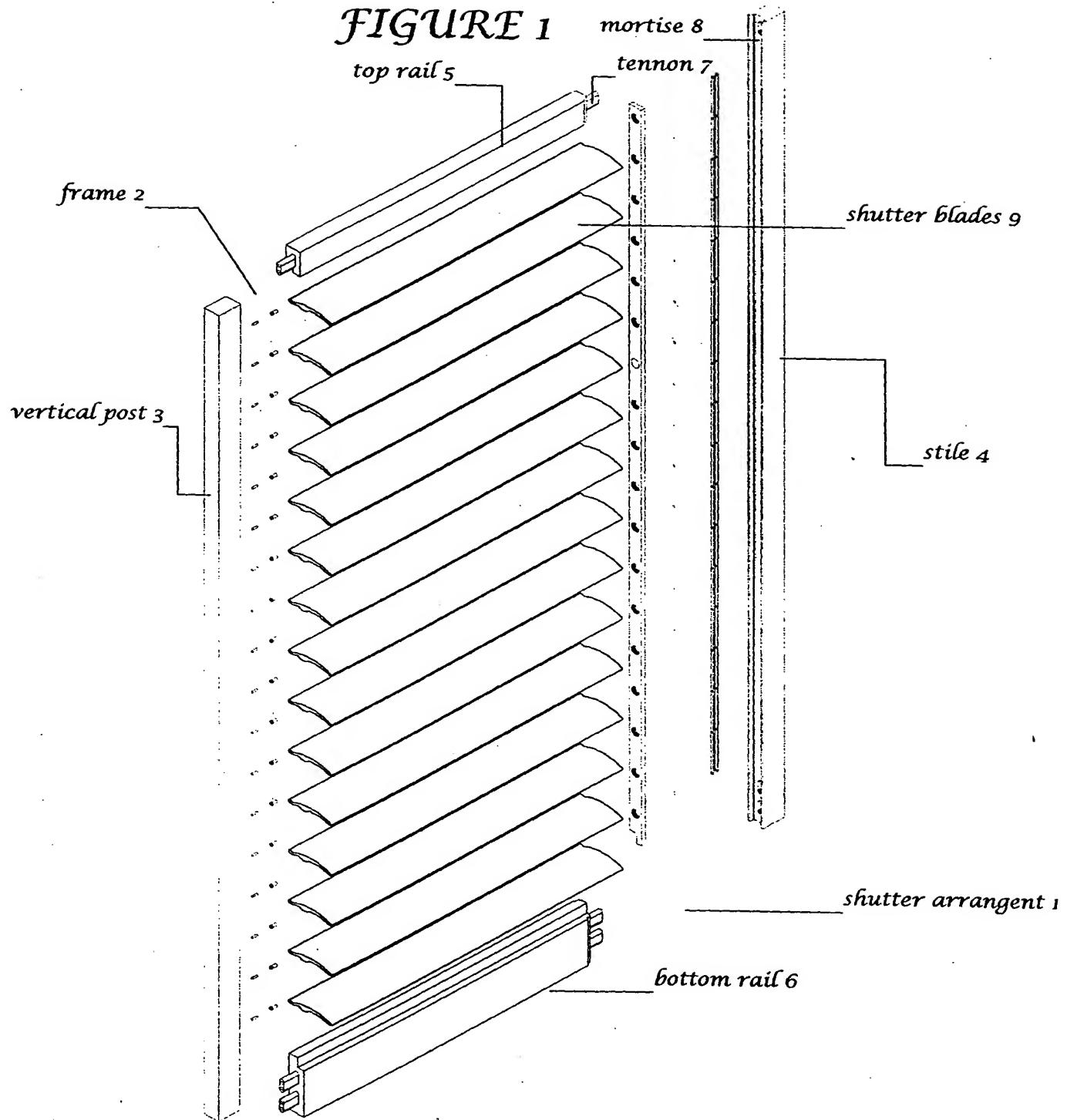


FIGURE 2

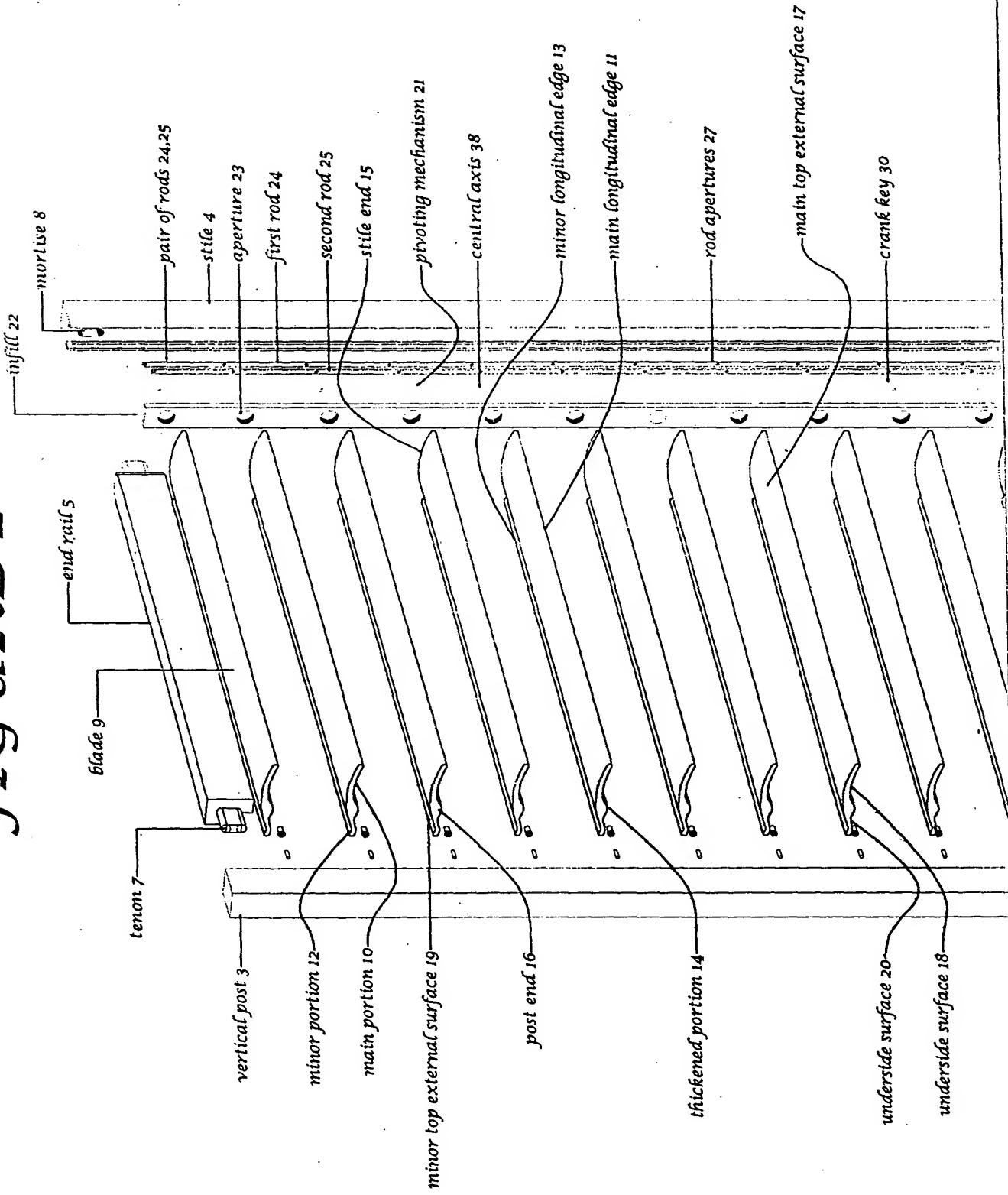


FIGURE 3

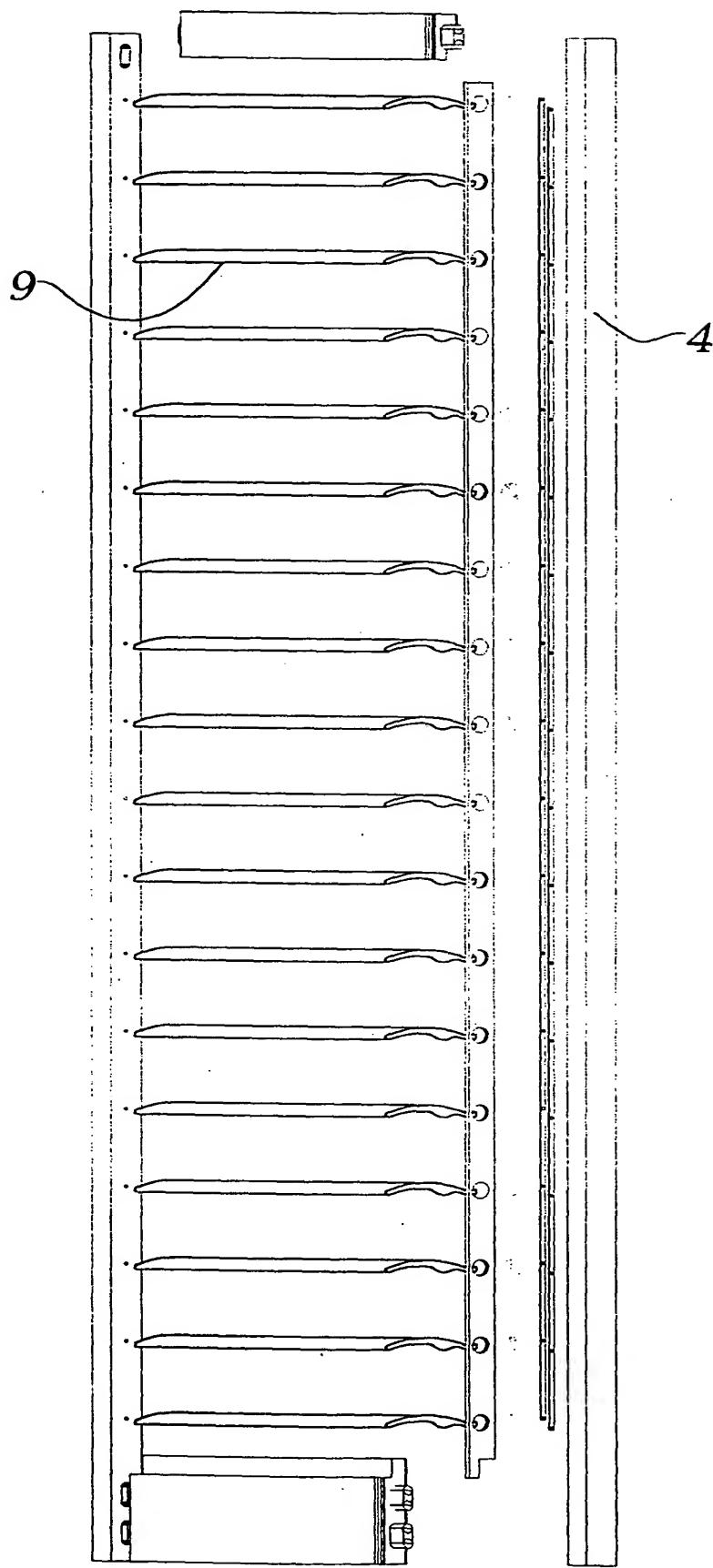


FIGURE 4

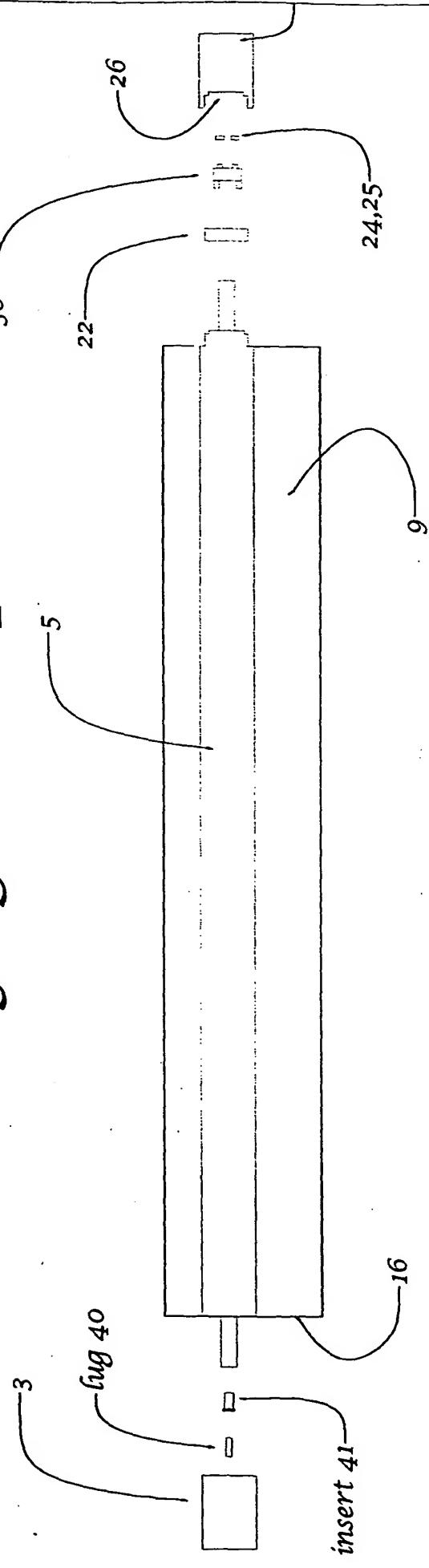


FIGURE 5

